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Abstract

Background

This article examines the relationship between lower income and the risk of experiencing high psychological distress over twelve years.

Data and methods

Data from the first 12 years of the longitudinal National Population Health Survey (1994/1995 through 2006/2007) were analysed. Proportional hazards modelling was conducted to determine whether lower household income was associated with a greater risk of experiencing high distress, when adjusting for sociodemographic characteristics and baseline health status. It was also used to examine the relationship between reporting a stressor and experiencing a subsequent episode of distress.

Results

Overall, 11% of the initial sample experienced at least one episode of high distress during the 12 years of the study. Low-income respondents were at a significantly higher risk of becoming psychologically distressed, and many of the stressors were associated with a significantly higher risk of becoming distressed. Stressors accounted for 22% of the relationship between low income and distress for men, and more than a third of this relationship for women.

Interpretation

Low income is an important risk factor for becoming psychologically distressed, and stressors account for part of this increased risk.

Keywords

psychological distress, socio-economic status, income, stressors, stress, longitudinal studies

Authors

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A large body of research has focused on the poorer physical health of individuals with low income, and important differences in the mental health of these groups can also be observed.[1,2] Much of this research, however, has been cross-sectional, making it difficult to determine whether low income or poor mental health comes first. As well, few studies have looked at this relationship in the Canadian context.

The primary purpose of this analysis is to examine whether people in lower-income groups had a greater risk of developing high levels of psychological distress over a twelve-year period, compared with those in higher-income groups. A second goal is to determine whether a higher level of stressors explains part of the relationship between lower income and high levels of psychological distress. Psychological distress is a non-specific psychological state characterized by feelings consistent with depressed mood or anxiety, such as feeling sad and nervous.[3] High levels of distress may indicate more serious disorders, such as clinical depression.[4]

Two directions for the association between income and mental health are possible: poorer mental health may lead to lower income, or lower income may cause poorer mental health.[5] The first is a health selection process, whereby individuals with mental health problems are less likely to be able to complete education or to engage in occupations associated with higher incomes. If this is the case, interventions should focus on improving mental health so that individuals can achieve higher education and income. Past research has shown, however, that health selection processes do not explain a large proportion of the relationship between low income and poorer mental health.[6]

Social causation, the second hypothesis, suggests that the poor overall mental health of low-income individuals is rooted in the negative social environment to which they are exposed. The social environment encompasses "the groups to which we belong, the

neighbourhoods in which we live, the organization of our workplaces, and the policies we create to order our lives."[7] One characteristic of a negative social environment is a higher prevalence of stressors, which are demands from the environment that tax or exceed the adaptive capacity of the individual.[8] Examples of stressors include marital discord, living in a neighbourhood that requires heightened vigilance because of crime, or high demands at work without adequate resources to meet the demands.

If the social causation hypothesis is correct, interventions aimed at improving a negative social environment would be expected to reduce inequities in health. Not only are individuals in lower income groups exposed to a high number of stressors, but they also have fewer resources, such as social support,[9] with which to cope and mitigate the negative effects of stressors. Higher stressors and few coping resources can increase feelings of distress, which have been linked to physical and mental disorders.[10]

In earlier Canadian research, Turner, Wheaton and Lloyd (1995) demonstrated a greater burden of stressors among low socio-economic status individuals in Toronto.[11] They reported that life events (major acute stressors such as the death of a spouse or the loss of one's job), chronic stressors (expected to continue over a period of months or years), and childhood traumas accounted for approximately a third of the relationship between occupation and depressive symptoms.

Analysing data from the first cycle of the National Population Health Survey (1994/1995), Cairney and Krause examined determinants of distress and depression among adults aged 50 or older.[9] They found higher levels of distress among those with less than a high school education, while no significant differences by education were observed for 12-month major depressive disorder. Accounting for stressors explained over a third of the relationship between education and distress.

Matthews et al., who studied psychological distress at age 33 in the 1958 British Birth Cohort,[12] found that work factors, specifically job strain and job insecurity, had an important role in occupational class differences in psychological distress. This effect was more pronounced for men than women.

Finally, Myer et al. found the mediating effect of life events between lower socio-economic status and psychological distress to be significant, although they did not report the magnitude of the effect.[13]

While these studies support the hypothesis that the social distribution of stressors contributes to the poorer mental health of lower socio-economic groups, the research is limited in that the studies were cross-sectional. The sequencing of the relationship between income, stressors and psychological distress is unclear. Longitudinal data are better suited to identifying risk factors for developing mental health problems and identifying appropriate targets of intervention.

This article, based on data from the 1994/1995 to 2006/2007 National Population Health Survey (NPHS), examines the income gradient in *new cases of high psychological distress* in a representative sample of Canadians over a *twelve-year period* from 1994/1995 to 2006/2007. Stressors in the social environment are also investigated, because they are expected to be associated with subsequent experience of high distress, and are expected to explain part of the association between lower income and the risk of becoming distressed. This research provides important evidence, which has not been reported elsewhere, of the temporal ordering of income, stressors and psychological distress based on longitudinal analysis.

Data and methods

Data source

This analysis is based on data from seven cycles (cycles 1 to 7) of the household component of the National Population Health Survey (NPHS), conducted by Statistics Canada from 1994/1995 to 2006/2007. Every two years since 1994/1995, the NPHS has collected data about health status, health behaviours, and other determinants of health. This survey is representative of the household population of all provinces in 1994/1995, excluding members of the regular Canadian Forces and residents of Indian reserves, Crown Lands, health institutions, Canadian Forces bases (military and civilian) and some remote areas in Ontario and Quebec. Although the NPHS also has an institutional component covering residents of health institutions such as nursing homes, that sample was not analysed in this article.

In 1994/1995, 20,095 household residents were selected to be members of the NPHS longitudinal panel. Of these, 86.0% agreed to participate (17,276), and 83.6% provided responses to the in-depth questionnaire. Response rates in subsequent cycles were 92.8% in 1996/1997; 88.3% in 1998/1999; 84.9% in 2000/2001; 80.8% in 2002/2003; 77.6% in 2004/2005; and 77.0% in 2007/2008. More detailed descriptions of the NPHS design, sample and interview procedures are available elsewhere.[14,15] In 1994/1995, data were collected primarily through computer-assisted personal interviews; thereafter, primarily through computer assisted-telephone interviews.

Measures

Household income

Income was based on self-reported household income. To account for inflation, household size and the cost of living in different urban and rural areas, self-reported household income was divided by a low income cut-off (LICO), as determined by the respondent's place of residence and

household size. (For detailed information about this income variable, refer to the NPHS Cycle 7 Derived Variable documentation.)

A variable was created representing the ratio of the respondent's household income to a corresponding LICO. A household with a ratio below 1 is more likely to be in a difficult financial situation because its spending on necessities tends to be a greater proportion of its income. With a ratio above 1, a household is more likely in a better financial situation, because it spends a smaller proportion of its income on necessities.

From this ratio, a categorical variable representing lower and higher income was created. Respondents with values of 1.5 or less were considered to be *lower income*. Those with values more than 1.5 were considered to be *higher income*. For example, in a large urban centre, members of a four-person household with a total income of $46,400 or less in 1994 would be considered lower income, as would people living alone in a rural area if their income was $17,200 or less. Individuals with missing income values were included in the analyses as a separate income group, in order to retain as many respondents as possible. Although not reported here, analyses using three income categories yielded similar results, with middle-income respondents having a lower relative risk (RR) of experiencing an episode distress than did those in the lower-income group, and higher RR than did those in the higher-income group.

The same cut-offs were used in subsequent cycles to categorize household income. Not surprisingly, as the survey continued and the participants aged, the proportion of respondents in the lower income group decreased, and the proportion in the higher income group increased.

This method of measuring income accounts for numerous factors that affect the tangible meaning of household income, which is the ability to access goods and services in one's area. Although this derived variable has LICO as its base, it is not meant to determine poverty, to measure income adequacy, or to estimate the number of Canadians in households whose total income is above or below the LICO.

Stressors

Recent life events, chronic stressors and job strain were assessed in the first, fourth, and subsequent NPHS cycles. Because stressors were not measured in the second and third cycles, the scores from 1994/1995 were imputed forward for these two cycles. Analyses using several methods of imputation yielded similar results; the strategy of imputing forward was adopted because it minimized the possibility of reverse causation. Recent life events and chronic stressors were measured with questions developed by Turner, Wheaton and Llyod.[11] Job strain was measured using an abbreviated version of the Job Content Questionnaire.[16]

The chronic stressors scale consisted of a series of 18 questions about situations that respondents reported they faced. The scale has been validated by Wheaton,[17] and demonstrates good convergent validity with indicators of difficult social circumstances, and discriminant validity with measures of psychological distress. The questions covered several domains: personal stress, such as "trying to take on too many things at once"; relationship problems with a spouse or partner; problems with one's children; family health problems; living in an undesirable neighbourhood; and financial problems. A dichotomous variable was created for each stressor domain, with 1 indicating a positive response to any question on the subscale, and 0 for those who answered negatively to all questions on that subscale.

Seven questions were used to measure the concept of job strain, which is based on Karasek's work with the demand control model and the US Quality of Employment Surveys.[16] A job is considered stressful if the incumbent must meet high demands without adequate resources and decision-making authority. Five questions measured decision latitude, and two measured psychological demands. Individuals falling in both the top third of demands and the lowest third of decision latitude based on the distribution of these variables in 1994/1995 were coded as experiencing job strain.

Distress

Distress was based on respondents' K6 scores. The K6 is a non-specific psychological distress measure developed by Kessler,[3,18] which has been used in numerous population-based surveys. The K6 measures distress through answers to six Likert-type questions scored from 0 to 6, which are summed to form a scale score ranging from 0 to 24. Kessler proposed a cut-off of 13 or higher as representing likely serious mental illness, based on requirements of the Substance Abuse and Mental Health Services Administration in the United States.[18] However, we conducted psychometric analyses to identify a less restrictive cut-off for the K6 if the outcome of interest was major depressive disorder or an anxiety disorder. Based on these analyses, a score of 9 or more was considered to indicate high psychological distress and possible mood or anxiety disorder. Recent analyses by Cairney et al. show that the K6 is a good screening tool for depression, and that a cut-off of 9 or more results in a stratum-specific likelihood ratio of more than 6 for 12-month major depressive disorder.[4] To control for the graded nature of the distress score for scores below the cut-off point of 9, a low distress score variable was included in the analysis.

The sociodemographic variables were: age, marital status (married/with partner/with spouse versus single or widowed/separated/divorced), urban/rural residence, birthplace, labour force status (employed versus unemployed or out of the labour force), and presence of children in the household. Because of the association between physical and mental health problems, self-rated health was included in models predicting

distress (scored on a 5-point scale ranging from poor to excellent).

Analysis

To be included in the dataset for analysis, respondents had to have a low distress score (see *Measures*) in 1994/1995 and be aged 18 to 75. Respondents contributed another observation to the dataset for each cycle through which they survived without experiencing high distress. If an individual's distress score was missing for the end of a studied interval, that interval was their last observed period, and they received a score of 0 on the event variable.

Proportional hazards modelling was conducted to determine if lower household income was associated with a greater risk of experiencing an episode of high distress. The first model (Model 1) examined income and cases of high distress, while controlling for sociodemographic predictors (age, marital status, urban/rural residence, birthplace, labour force status, presence of children in the household) and self-rated health and baseline low distress score. The predictors in the model were time-varying covariates: they reflected the value for the respondent two years before observation of the event (that is, becoming distressed). The second model (Model 2) included stressors, which were also time-varying. Because the stressors were not measured at cycles 2 and 3, values for cycle 1 were imputed to cycles 2 and 3. The analysis was conducted in SAS using the bootstrap weights developed by Statistics Canada.[19,20] Because of the discrete nature of the time of measurement, logistic regression using a complementary log-log link was conducted, excluding the intercept and including an indicator variable for time of observation.

Since one of the goals was to determine if stressors were a mediating factor linking lower income with higher distress, a mediational analysis was conducted.[21] A mediational analysis examines whether a proposed mediator (in this case, stressors) may explain part of the relationship between and independent variable (IV: income) and the dependent variable (DV: high psychological distress). Mediation is demonstrated by a reduction of the relationship between the IV and the DV when the proposed mediator is taken into account. A detailed explanation is provided in Baron and Kenny.[21] To ensure consistency across models, only individuals with full data on all variables were included, resulting in the exclusion of 1,077 records, or slightly more than 2% of observations.

The percentage reduction in the relative risk (RR) associated with income between the model excluding (Model 1) and including stressors (Model 2) was calculated: (RR1-RR2)/(RR1-1).

Results

Prevalence of high distress and stressors

Among an initial cohort of 11,058 individuals aged 18 to 75 with low distress scores in 1994/1995, 1,191 first episodes of high psychological distress were observed over the period to 2006/2007. Thus, 11% of the sample experienced high distress at some point during those twelve years. Among the sample with no missing data (n=10,948), 47,379 person-periods at risk were observed, with 1,152 episodes of high psychological distress. There were fewer cases of high distress among

Table 1
Prevalence of selected characteristics of sample, by sex, Canada 1994/1995

	Men		Women	
	Number	Percent	Number	Percent
Sample size	5,014	100.0	5,934	100.0
Household income				
Lower	1,607	29.9	2,396	37.4
Higher	3,100	62.7	3,188	56.5
Missing	307	7.3	350	6.1
Age (mean)	42	..	43	..
Marital status				
Married	3,111	68.2	3,535	67.4
Single	1,330	24.4	1,109	17.0
Divorced/Widowed/ Separated	573	7.4	1,290	15.7
Residence				
Urban	3,692	81.7	4,565	83.7
Rural	1,322	18.3	1,369	16.3
Birthplace				
Canada	4,336	81.5	5,141	80.9
Foreign-born	678	18.5	793	19.1
Labour force status				
Employed	3,139	65.7	2,729	47.1
Unemployed	640	12.5	804	14.4
Out of labour force	1,235	21.8	2,401	38.6
Children in household				
Children	3,145	64.7	4,342	74.3
Children younger than 12	1,128	28.1	1,701	32.7
Stressors				
Personal stress	2,641	55.9	3,566	61.5
Financial problems	1,986	39.6	2,139	35.0
Neighborhood problems	1,177	24.6	1,375	24.0
Problems with children	1,071	21.0	1,496	24.7
Family health problems	1,049	19.9	1,492	24.0
Relationship problems	509	11.2	712	14.1
Job strain	358	7.0	536	9.0
Recent life events (mean number)	0.47	..	0.49	..

.. not applicable
Source: 1994/1995 to 2006/2007 National Population Health Survey.

men than among women (407 versus 745).

Some stressors were more prevalent than others in 1994/1995 (Table 1). Personal stress, such as having too many things expected by others, was the most common stressor, reported by the majority of men (56%) and women (61%). A quarter of men and women reported problems with their neighbourhood. Relationship problems were relatively uncommon— 11% of men and 14% of women. Job strain was even less prevalent, with 7% of men and 9% of women in the sample experiencing it.

Lower income and risk of becoming distressed

Among both men and women, lower household income was significantly associated with a higher risk of becoming distressed (Table 2, Model 1). Lower-income men were 1.58 times as likely

Table 2
Relative risk of becoming distressed, by household income group, sociodemographic characteristics, stressors and sex, household population, Canada excluding territories, 1994/1995 to 2006/2007

	Men						Women					
	Model 1			Model 2			Model 1			Model 2		
		95% confidence interval			95% confidence interval			95% confidence interval			95% confidence interval	
	Relative risk	from	to	Relative risk	from	to	Relative risk	from	to	Relative risk	from	to
Household income												
Lower	1.58*	1.15	2.17	1.45*	1.07	1.98	1.25*	1.02	1.53	1.16	0.95	1.43
Higher†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Age‡	0.99	0.98	1.00	0.99	0.99	1.00	0.98*	0.97	0.99	0.99	0.98	1.00
Marital status												
Married†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Single	0.85	0.56	1.28	0.86	0.57	1.30	1.13	0.83	1.53	1.16	0.85	1.59
Divorced/Widowed/Separated	1.28	0.86	1.91	1.30	0.87	1.94	1.09	0.85	1.38	1.08	0.84	1.38
Residence												
Urban†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Rural	1.11	0.85	1.45	1.15	0.87	1.51	0.94	0.76	1.18	0.94	0.76	1.18
Birthplace												
Canada†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Foreign-born	1.22	0.86	1.74	1.24	0.87	1.77	1.13	0.86	1.48	1.13	0.86	1.48
Labour force status												
Employed†	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Unemployed	1.00	0.65	1.53	1.44	0.97	2.12	1.43	1.00	2.04	1.56*	1.06	2.28
Out of labour force	1.18	0.81	1.70	1.11	0.71	1.73	1.11	0.86	1.44	1.29	0.99	1.69
Children in household												
None	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Children	0.65*	0.46	0.91	0.68*	0.47	0.98	1.28	0.92	1.78	1.05	0.75	1.47
Children younger than 12	0.96	0.62	1.49	0.92	0.60	1.41	0.89	0.69	1.14	0.90	0.71	1.14
Baseline distress	1.53*	1.38	1.71	1.46*	1.30	1.64	1.59*	1.44	1.75	1.50*	1.36	1.66
Baseline self-rated health	1.51*	1.32	1.74	1.47*	1.27	1.69	1.39*	1.25	1.55	1.33*	1.19	1.49
Stressors§												
Job strain	...	...	...	1.95*	1.28	2.97	...	...	...	1.34	0.97	1.85
Financial problems	...	...	...	1.32	1.00	1.75	...	...	...	1.19	0.98	1.45
Personal stress	...	...	...	1.26	0.96	1.66	...	...	...	1.61*	1.26	2.07
Relationship problems	...	...	...	1.31	0.92	1.87	...	...	...	1.20	0.93	1.56
Neighbourhood problems	...	...	...	1.26	0.95	1.66	...	...	...	1.04	0.84	1.29
Problems with children	...	...	...	0.88	0.62	1.23	...	...	...	1.23	0.98	1.54
Family health problems	...	...	...	1.07	0.79	1.47	...	...	...	0.96	0.79	1.17
Recent life events	...	...	...	1.06	0.91	1.23	...	...	...	1.13*	1.04	1.24
- 2 log likelihood	3929.27			3873.61			5669.42			5594.51		

† reference category
‡ use as a continuous variable
§ reference category is absence of stressor
* significantly different from estimate for reference category ($p < 0.05$)
... not applicable
Source: 1994/1995 to 2006/2007 National Population Health Survey

Table 3
Relative risk of becoming distressed by stressors and sex, controlling for sociodemographic factors, Canada 1994/1995 to 2006/2007

	Men			Women		
	Relative risk	95% confidence interval		Relative risk	95% confidence interval	
		from	to		from	to
Job strain[†]	2.04*	1.34	3.11	1.44*	1.04	1.99
Financial problems[†]	1.50*	1.14	1.96	1.34*	1.11	1.63
Personal stress[†]	1.38*	1.05	1.82	1.74*	1.37	2.21
Relationship problems[†]	1.51*	1.07	2.12	1.40*	1.07	1.82
Neighbourhood problems[†]	1.41*	1.08	1.84	1.19	0.97	1.47
Problems with children[†]	0.99	0.70	1.39	1.39*	1.11	1.73
Family health problems[†]	1.18	0.88	1.57	1.11	0.91	1.35
Recent life events[‡]	1.13	0.98	1.31	1.19*	1.09	1.30

† reference category = stressor not reported
‡ relative risk = increase in risk with one unit increase in life events
* significantly different from estimate for reference category ($p < 0.05$)
Source: 1994/1995 to 2006/2007 National Population Health Survey

as higher-income men to become distressed, even when the influence of factors such as age, urban/rural residence, and immigrant, parental and labour force status was controlled. Lower-income women were at a 25% greater risk of becoming distressed than were higher-income women.

Other risk factors

For both sexes, other characteristics significantly associated with a heightened risk of becoming distressed were poorer self-rated health and higher baseline distress scores. For men, having children in the household was associated with a significantly reduced risk of becoming distressed, compared with not having children. For women, younger age and being unemployed rather than employed was associated with a significantly higher risk of becoming distressed.

Stressors and risk of distress

When studied individually (Table 3), most of the stressors were associated with a significantly higher risk of becoming distressed. Men experiencing job strain were twice as likely to become distressed as were those in low-strain jobs; women experiencing job strain had a 44% greater risk. Financial problems, personal stress and relationship problems were each significantly related to the risk of becoming distressed for both sexes. For men, neighbourhood problems increased the risk by 41%. By contrast, problems with children were associated with becoming distressed for women but not for men: women reporting problems with their children were 39% more likely to become distressed than were women without this stressor. Recent life events were also significant for women, but not for men. With almost every life event reported, women were about 20% more likely to develop distress. Family health problems were not a significant risk factor for either sex.

Stressors mediate income-distress relationship

When stressors were included in the model, the relationship between household income and distress diminished. The reduction in the -2 log likelihood from Model 1 to Model 2 was significant for both sexes, indicating that the addition of stressors improved model fit. The reduction in the relative risk associated with low income was 22% for men and 36% for women.

Discussion

This study demonstrates that lower income is associated with a higher risk of becoming distressed, but that this risk is partially accounted for by the higher prevalence of stressors in the lives of lower-income individuals. The study supports the social causation hypothesis of the income gradient in health, because lower income preceded the development of high psychological distress.

The social environment also appears to be implicated in this relationship. Because a fairly high level of household income was chosen to define the lower-income group (1.5 times or less the low income cut-off), a substantial proportion of respondents were not living in material deprivation. Thus, we conclude that factors beyond material deprivation are contributing to income differences in mental health. While financial and neighbourhood problems are more closely related to material resources, stressors such as difficulties with children and relationships are more clearly social in nature. Because the association between income and developing psychological distress weakened when stressors were taken into account, this study provides support for the mediating role of social stressors in income-related health inequalities.

The results of this analysis parallel those of studies examining stressors as mediators of the income-physical health relationship, using cross-sectional[22] and longitudinal analyses.[23] While other research has demonstrated the role of stressors in the income gradient in mental health,[9,11,12] the longitudinal nature of the data analysed in this article provides evidence for the temporal sequencing of the income-distress relationship. In this study, low self-rated health and the presence of even low distress at baseline also predicted episodes of high psychological distress, consistent with findings from cross-sectional studies. And among the participants in this study, lower income and stressors preceded distress.

What is already known on this subject?

- Lower income is strongly related to individuals' mental health, including their feelings of psychological distress.
- Stressors are more prevalent among lower income groups and may explain part of this relationship.
- The temporal ordering of these factors has not been demonstrated in a Canadian population survey.

What does this study add?

- This paper shows that lower income is significantly related to future episodes of high psychological distress, and that stressors mediate a modest part of this relationship.
- The everyday social environments of low-income Canadians are implicated in health disparities.

Limitations

This analysis has a number of limitations. First, all data were self-reported. It is well known that negative affectivity is associated with reporting stressors, poor health and distress, and thus, the results may reflect confounding by this unmeasured variable.[24] However, other research has demonstrated that negative affectivity may be on the causal pathway linking stressors and poor health, and consequently, this may not be an instance of confounding but of mediation.[25]

Respondents were interviewed at two-year intervals; no information is available about what happened to them between interviews. It is possible that they experienced an unmeasured episode of high distress between observations.

As well, stressors were measured only at cycles 1, 4, 5 and 6, and were imputed for cycles 2 and 3 from cycle 1. It is possible that stressors resolved themselves between cycles 1 and 4, or that new stressors appeared that were not taken into account.

Finally, not all respondents were followed up in all cycles. Although the attrition rate in the NPHS is quite low compared with other surveys, a substantial number of respondents were lost from the study. If those who continued in the survey differed systematically from those who dropped out, systematic bias may have been have introduced into the results. Even so, other analyses of NPHS data have demonstrated that those lost to attrition were no more or less likely to experience episodes of distress than were those who were always present.[26] Thus, it is unlikely that attrition biased the results.

Conclusion

Future research should examine the predictors of multiple episodes of distress and the chronicity of distress, neither of which were analysed in the present study. Changes in income may also be important predictors of distress and should be explored further. Finally, including other components of a stress process model, such as mastery, self-esteem and social support, in an expanded model may further clarify the complex pathways between income, stressors and poor mental health. While more research is clearly needed, the present results point to the need to examine the social environment as one of the drivers in income-related disparities in mental health among Canadians.

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